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FOREST AND RANGE
EXPERIMENT STATION,
Berkeley, California

U.S. ~~DEPARTMENT OF AGRICULTURE~~
FOREST SERVICE,

TECHNICAL PAPER NO. 53
DECEMBER 1960

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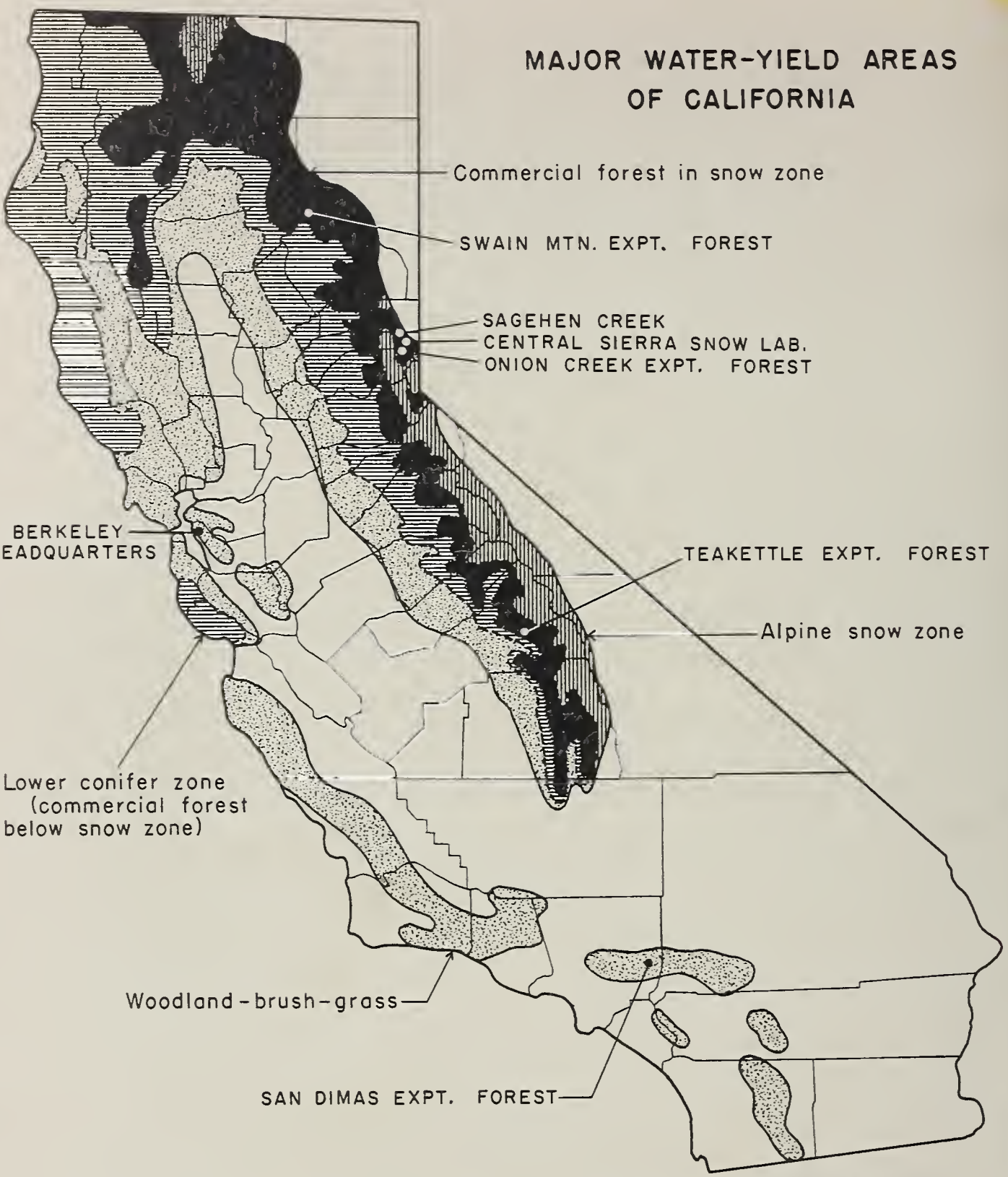
CATALOGING PREP

WATERSHED MANAGEMENT

. . . an annotated bibliography of erosion, streamflow, and water yield publications from the Pacific Southwest Forest and Range Experiment Station. . . SUPPLEMENT NO. 1



MAJOR WATER-YIELD AREAS OF CALIFORNIA	AREA million acres	AVERAGE ANNUAL WATER YIELD million acre feet	percent
Woodland-brush-grass	18	9	12
Lower conifer zone	12	23	32
Forest in snow zone	9	27	38
Alpine snow zone	3	9	13
Total	42	68	95
Total for state	101	71	100

WATERSHED MANAGEMENT--AN ANNOTATED BIBLIOGRAPHY OF EROSION, STREAMFLOW, AND WATER YIELD PUBLICATIONS FROM THE PACIFIC SOUTHWEST FOREST AND RANGE EXPERIMENT STATION--SUPPLEMENT NO. 1

By
Clark H. Gleason

Technical Paper No. 53
December 1960

U. S. DEPARTMENT OF AGRICULTURE, FOREST SERVICE
Pacific Southwest Forest and Range Experiment Station

FOREWORD

Technical Paper No. 23 listed and described watershed management publications by workers at the California Forest and Range Experiment Station from its establishment in 1926 to the end of May 1957. This supplement describes their publications from June 1957 through May 1960, during which period the Station's name was changed to Pacific Southwest Forest and Range Experiment Station. Also included are several citations from 1954 to 1957 that were overlooked in the earlier paper.

Titles in the supplement are numbered consecutively with those in Technical Paper 23, beginning with number 205, to avoid possible confusion with the references listed before. Papers that have been presented at meetings, and of which copies are available upon request to the Station, are listed as publications, together with the citation to any abstract of these papers published. Book reviews are not listed. The indexes in this supplement cover only the publications listed here.

The annotations have used abstract material prepared by the authors or by others wherever possible, and their contribution is gratefully acknowledged.

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(205) ANONYMOUS
1957. Inexpensive maximum water stage recorder. Engin. News-Record Vol. 158, June 13, 1957, p. 86, illus.

Describes a device designed by Lowell A. Andrews, of the U. S. Forest Service, to record maximum water stage in streams. The device consists of a ratchet and pawl attached to a wheel operated by a standard float and tape. Cost of special parts is approximately $10.00

(206) ANONYMOUS
1958. Added pen takes guess out of flow gage. Engin. News-Record Vol. 160, June 19, 1958, p. 125, illus.

Describes an attachment for indicating pen reversals on FW-1 water level recorders to aid in correct interpretation of streamflow records. The attachment was devised by Lowell A. Andrews of the U. S. Forest Service.

(207) ANONYMOUS
1959. Managing our snow for a better water supply. U. S. Forest Serv. Pacific Southwest Forest and Range Expt. Sta. and Calif. Dept. of Water Resources, 17 pp., illus.

A "picture book" of the California Cooperative Snow Management Research Program and highlights of results to date.

(208) ANDERSON, H. W.
1957. Relating sediment yield to watershed variables. Amer. Geophys. Union Trans. 38(6): 921-924.

Explains the use of multiple regression analysis to separate and evaluate effects of the several watershed processes that affect sediment yield. Discusses variables used, regression results, tests of significance, the effects of neglected variables, errors in variables, and exclusion of non-significant variables. Concludes that the method is highly useful in sedimentation studies, and that its application can be improved with greater knowledge of sedimentation processes.

(209) ANDERSON, HENRY W.
1958. Rain-snow flood sources meteorologically defined. U. S. Forest Serv. Pacific Southwest Forest and Range Expt. Sta. 19 pp., illus. Abstract in Bul. Amer. Met. Soc. 39(3): 174-175.

Flood peak discharges of 54 watersheds of the Willamette Basin, Oregon, in 43 storms were related by multiple regression analysis to five meteorological variables and four watershed variables. The results were interpreted in terms of the relative frequency of floods in various elevation zones of western Oregon.

(210) ANDERSON, HENRY W.
1958. Progress report, 1957-58, cooperative snow management research. U. S. Forest Serv. Calif. Forest and Range Expt. Sta. 56 pp., illus.

Objectives, methods, plans and results of 18 snow management studies in the headwaters of five major California river basins are summarized and indexed. Basic meteorology, snow, sediment, and streamflow data are included.

(211) ANDERSON, HENRY W.
1958. Progress in snow management research in California. 26th Ann. Western Snow Conf. Proc. 1958: 12-21.

The report outlines basic principles of improving water yield from California's snow zone, studies underway to develop and test methods of improving water yield through land management in the zone, and first results of some of these studies.

(212) ANDERSON, H. W.
1959. Water yield control through management in snow pack watersheds. 1st. Intersociety Conf. on Irrig. and Drain. Proc. 1959: 13-18. U. S. Natl. Comm., Internatl. Commission on Irrig. and Drain., Denver, Colo.

Discusses problems and an approach to water yield improvement, describes studies begun in 1957 toward such improvement and gives first results of a forest density inventory and wind direction and velocity studies in the snow zone.

(213) ANDERSON, HENRY W.
1960. Research in management of snowpack watersheds for water yield control. Jour. Forestry 58(4): 282-284, illus.

Lists the areas of study in California's snowpack watersheds, and then presents highlight results from several studies including a forest land inventory of the Sierra Nevada west slope above 5,000 feet, basic studies of snow accumulation and melt, basic studies of heat and radiation, basic wind measurements, and studies of winter and summer water loss. Suggests logging to accumulate snow and delay its melt by cutting east-west strips progressively southward. This would ultimately produce a wall-and-step forest giving maximum shade from trees south of the cut strip, and minimum radiation from trees to the north of it.

(214) ANDERSON, H. W.
1960. Three years of progress in "Operation Wet Blanket." U. S. Forest Serv. Pacific Southwest Forest and Range Expt. Sta. 9 pp., illus. Abstract in Jour. of Geophys. Res. 65(5): 1632.

"Operation Wet Blanket," a research proposal of the late E. A. Colman, has been developed as the California Co-operative Snow Management Program. The studies and their findings to date are described. Some highlights:

In the Sierra Nevada snow zone a tree canopy covers only 22 percent of the area, bare ground 29 percent, brush and grass 24 percent.

The most snow collects in forest openings 1/2 to 2 tree heights wide.

Snow patches in spring gain water from the air by condensation.

Water can be saved by logging and brush removal.

Improved water yield is promised by logging successively in strips so as to make a wall-and-step forest.

(215) ANDERSON, H. W.
1960. Proposed program for watershed management research in lower conifer zone of California. U. S. Forest Serv. Pacific Southwest Forest and Range Expt. Sta. Tech. Paper 46, 21 pp., illus.

An analysis is made of the problems and present state of knowledge affecting watershed management in California's commercial timber zone where rainfall is heavy and snowmelt rapid. A 10-year program of research on water yield, water quality, floods, and sedimentation as influenced by different land management practices is proposed. The program includes an inventory of present conditions, basic studies of forest hydrology, plot studies of management methods, and pilot tests on whole watersheds. A list of 31 possible studies is followed by personnel, equipment, and budget requirements for the program.

(216) ANDERSON, H. W., COLEMAN, G. B., and ZINKE, P. J.
1959. Summer slides and winter scour--dry-wet erosion in southern California mountains. U. S. Forest Serv. Pacific Southwest Forest and Range Expt. Sta. Tech. Paper 36, 12 pp., illus.

Summarizes the results of 5 years' study of the sources and the processes of soil, rock, and organic debris movement down slopes at 4 study areas in the San Gabriel Mountains.

(217) ANDERSON, HENRY W. and GLEASON, CLARK H.
1959. Logging effects on snow, soil moisture, and water losses. 27th Ann. Western Snow Conf. Proc. 1959: 57-65, illus.

Reports first results of studies of water yield in the Sierra Nevada as affected by 3 types of logging, and of snow accumulation as affected by forests, natural forest openings, logging, and slash disposal.

(218) ANDERSON, H. W., and HELLMERS, H.
1954. Progress report, cover improvement research, Los Angeles River watershed. U. S. Forest Serv. Calif. Forest and Range Expt. Sta. 17 pp., illus.

Summarizes research on the reduction of soil movement by vegetative means on steep slopes of the Los Angeles River watershed. Covers findings to July 1, 1954 and gives plans for the new fiscal year. Reports installation of 5 troughs to catch material eroded from steep slopes, and first-year erosion results by seasons.

(219) ANDERSON, HENRY W., and HOBBA, ROBERT L.
1959. Forests and floods in the northwestern United States. International Union of Geodesy and Geophysics, Symposium on Woodlands and Water. Hannover-Munden, Germany. Proc. 1959: 30-39.

Evaluates effects of timber cutting and burning on flood peak discharges in rain-on-snow and snowmelt floods. Methods of multiple regression, covariance, and double-mass analysis were used.

(220) ANDERSON, H. W., and PAGENHART, T. H.
1957. Snow on forest slopes. 25th Ann. Western Snow Conf. Proc. 1957: 19-23.

Relates snow accumulation and melt to variables of terrain, forest shade and shelter, and solar energy, using multiple regression analysis of data from 32 snow courses at the Central Sierra Snow Laboratory. Expressing the slope and aspect variables in terms of solar energy received was found to improve the estimate of terrain effect by 15 percent. Inclusion of the forest variables improved the estimate by 24 percent.

(221) ANDERSON, H. W., RICE, R. M., and WEST, A. J.
1958. Forest shade related to snow accumulation. 26th Ann. Western Snow Conf. Proc. 1958: 21-31, illus.

Electronic computer was used to test various measures of forests as they affect snow accumulation. The measures tested ranged from a single-valued index of forest cover (cover density) to 7- variable expression of the same forest cover. The evidence was that forest variables were improved when they were specifically designed to index the separate effects of forests

on solar radiation received at the snow surface, back radiation from the trees, interchange of energy between forests, clouds, and sky, and interception loss. Many of the forest effects are not linear; forest effects are much better indexed when this is taken into account in the analysis.

(222) ANDERSON, H. W., RICE, R. M., and WEST, A. J.
1958. Snow in forest openings and forest stands. Soc. Amer. Foresters Proc. 1958: 46-50, illus.

Snow measurements at 57 courses in 1957-58 are interpreted to give choices of size, shape, and orientation of forest openings for increasing snow accumulation and delaying melt. The analysis suggests that L-shaped openings might be best on east and west slopes while strips 1 to 2 tree-heights wide might be best on north and south slopes.

(223) ANDERSON, HENRY W., and RICHARDS, LUCILLE G.
1959. Progress report 1958-59, cooperative snow management research. U. S. Forest Serv. Pacific Southwest Forest and Range Expt. Sta. pp. 57-88, illus. (Paged consecutively with similar report for 1957-58 by Anderson.)

Summarizes results of the 18 snow zone hydrology studies during 1958-59 and outlines plans for each study. Gives basic meteorological data, snow measurements, streamflow and sedimentation data for certain stations. Results are indexed.

(224) ANDREWS, L. A., and BROADFOOT, W. M.
1958. The San Dimas soil core sampler. Soil Science 85(6): 297-301, illus.

Describes a hand operated soil sampling tube designed to cut a 2.5 inch core with little or no compaction. The sampler employs an external rotating cutter. Handle extensions permit its use in deep soils.

(225) ASHBY, WILLIAM C., and HELLMERS, HENRY
1955. Temperature requirements for germination in relation to wild-land seeding. Jour. Range Mangt. 8(2): 80-83.

Reports a study designed to determine the relationship of temperature to germination of various grasses and forbs considered promising for range improvement and erosion-control seeding of burned-over wildlands in southern California. The seeds were sown under controls simulating summer, spring-fall, and winter temperatures. Of the 20 species tested only 11 germinated equally well over the entire range of seasonal temperature conditions. It was concluded that successful field sowings require species that will germinate under temperatures that occur when soil moisture is adequate.

(226) ASHBY, WILLIAM C., and HELLMERS, HENRY
1959. Flowering and growth responses to photoperiod and temperature for six southern California grasses. The Botanical Gazette 120(3): 151-157, illus.

Both photoperiod and temperature were found to markedly affect growth and flowering of the annual and perennial grasses studied.

(227) COURT, ARNOLD
1957. Wind direction during snowfall at Central Sierra Snow Laboratory. 25th Ann. Western Snow Conf. Proc. 1957: 39-43, illus.

In the first 3 months of 1957 more than two thirds of the precipitation occurred with southwest winds. During non-storm periods the wind direction was typically northeast (down-valley) during the night and morning, and southwest (up-valley) in the afternoon and evening.

(228) COURT, ARNOLD
1958. Selection of "best" snow course points. 26th Ann. Western Snow Conf. Proc. 1958: 1-12, illus.

The median of the snow water equivalents at 5 points is practically as good a measure of snow on a snow course as is the mean of 17 points, both for estimating the "true" mean of the course and for predicting the flow of a nearby stream.

(229) GLEASON, CLARK H.
1958. Watershed management--an annotated bibliography of erosion, streamflow, and water yield publications by the California Forest and Range Experiment Station. U. S. Forest Serv. Calif. Forest and Range Expt. Sta. Tech. Paper 23, 79 pp., illus.

Lists and describes 204 staff publications on forest influences from establishment of the experiment station in 1926 to May 1957; cites several earlier publications that helped orient early research at the station.

(230) HAMILTON, EVERETT L., and REIMANN, LYLE F.
1958. Simplified method of sampling rainfall on the San Dimas Experimental Forest. U. S. Forest Serv. California Forest and Range Expt. Sta. Tech. Paper 26, 8 pp., illus.

By refining rainfall measurement techniques and sampling methods a 21-gage network was made more useful than a former network of 300 gages.

(231) HELLMERS, H., and ANDERSON, H. W.
1955. Progress report, stabilization of critical sediment sources, Los Angeles River watershed. U. S. Forest Serv. Calif. Forest and Range Expt. Sta. 12 pp., illus.

Reports research on methods to reduce soil movement on steep mountain slopes. Trough installations showed that for the second year the highest rates of soil movement occurred on slopes above rejuvenated mountain channels. The parts of a slope were classified, described, and interpreted as to principal soil movement processes.

(232) HELLMERS, HENRY, and ASHBY, WILLIAM C.
1958. Growth of native and exotic plants under controlled temperatures and in the San Gabriel Mountains California. Ecology 39(3): 416-428.

Reports a study to determine the plant species most adapted for soil stabilization use in the San Gabriel Mountains. The growth of 24 selected exotics and 8 natives was compared. Baccharis pilularis ssp. typica was outstanding with respect to survival and growth form. Three legumes, Cytisus canariensis, Calycotome villosa, and Spartium junceum, were found well adapted and desirable for their soil building qualities although not particularly good as cover plants.

(233) HELLMERS, HENRY, and KELLEHER, JOHN M.
1959. Ceanothus leucodermis and soil nitrogen in southern California mountains. Forest Science 5(3): 275-278.

Site conditions of three mountain soils were found to be improved through increased nitrogen content where chaparral whitethorn was grown.

(234) HELLMERS, H., and ZINKE, P. J.
1956. Progress report, stabilization of critical sediment sources, Los Angeles River watershed. U. S. Forest Serv. Calif. Forest and Range Expt. Sta., 8 pp.

Reports that chaparral cover can be increased by applying nitrogen fertilizer, that cover improvement by interplanting is difficult or impossible because of root competition, and that mechanical stabilization is prerequisite to plant establishment on steep slopes. Recommends legumes to improve site conditions. Erosion by dry creep in summer was almost as great as by washing in winter. The greatest yields of sediment came from rejuvenated slopes aggregating only about 10 percent of the watershed. A soil-vegetation survey is recommended as the best means of locating slopes for planning corrective treatment.

(235) HOPKINS, WALT
1958. Cooperative financing of water management projects in California. 2nd Ann. Meeting, Arizona Watershed Program, Proc. 1958: 63-66.

Reviews cooperative flood control and water supply projects in California, then describes several lines of research underway with federal-state-local cooperation to protect watersheds and improve water yield.

(236) HOPKINS, WALT
1958. More good water--research at San Dimas Experimental Forest applying fundamentals to entire watersheds. U. S. Forest Serv. Calif. Forest and Range Expt. Sta. Misc. Paper 22. 6 pp., illus.

Highlights past research results at the San Dimas Experimental Forest and discusses current studies of watershed management for increased water yield.

(237) HOPKINS, WALT
1959. More water from the uplands. Irrig. Districts Assn. of Calif. Biennial Convention, Minutes 1959: 2-5.

Describes watershed management research at the San Dimas Experimental Forest in the chaparral zone of southern California, and at several points in the snow zone of the Sierra Nevada.

(238) HOPKINS, WALT
1959. Snow management research in the Sierra Nevada--a review and a look ahead. 27th Ann. Western Snow Conf. Proc. 1959: 75-78.

The pioneering work of Dr. J. E. Church on snow research in the Sierra Nevada is reviewed in the light of its contribution to current research programs.

(239) HOPKINS, WALT, SINCLAIR, J. D., and ROWE, P. B.
1958. From forest influences to applied watershed management in southern California. Soc. Amer. Foresters Proc. 1958: 36-38.

A review of past research accomplishments and discussion of current water yield studies at San Dimas Experimental Forest.

(240) JOHANNESSEN, C. L.
1957. Anti-freezing hoods for V-notch weirs. Jour. Forestry 55(8): 590, illus.

To retard or eliminate freezing at V-notch weirs, an aluminum-foil-lined plywood hood has been designed. The hood is

self-removing during high flows. The design given was for 90° V-notch weirs. Recent tests indicate that for 120° V-notch weirs the tail apron should be about 3 inches longer for the same performance.

(241) MERRIAM, ROBERT A.
1959. Nuclear probe compared with other soil moisture measurement methods. U. S. Forest Serv. Calif. Forest and Range Expt. Sta. Res. Note 146, 5 pp., illus.

The gravimetric, Colman unit, and nuclear probe methods of measuring soil moisture gave similar results when tested at the San Dimas Experimental Forest in lysimeters filled with uniformly mixed soil 6 feet deep.

(242) MERRIAM, ROBERT A.
1960. Moisture sampling in wildland soils with a neutron probe. Iowa State Jour. Sci. 34(4): 641-647, illus.

Explains the theory of the neutron probe for measuring soil moisture; describes the equipment and its operation; reports similar measurements obtained with the probe, Colman electrical resistance units, and gravimetric methods; reports soil moisture savings through the defoliation of plants; and discusses the advantages and disadvantages of the neutron probe.

(243) MILLER, DAVID H.
1959. Discussion of "Application of snow hydrology to the Columbia basin" by Oliver A. Johnson and Peter B. Boyer (Amer. Soc. Civ. Engin., Jour. of Hydraul. Div., Proc. Paper 1904, Jan. 1959.) Amer. Soc. Civ. Engin., Jour. of Hydraul. Div., Proc. Paper 2138, Vol. 85, HY 8, Aug. 1959: 109-117.

Adds perspective on a ten-year research program in snow hydrology in the Sierra Nevada, Cascades, and Northern Rockies, and takes up problems of the water balance and heat balance that figured in this program. Study of the heat balance emphasized short-wave and long-wave radiation, and developed a method for estimating rate of snow melting in drainage basins. The discussion describes end-products of the program in the form of hydrometeorological logs of observations and 50 or 60 research reports of limited distribution, cites a dozen papers published in the open literature, and makes a plea that more of the results of the program be published by the research men.

(244) NELSON, ROBERT E.
1957. Soil-vegetation survey of a central Sierra snow zone watershed. U. S. Forest Serv. Calif. Forest and Range Expt. Sta. Misc. Paper 21, 43 pp., illus.

Maps and describes the timber stands, vegetation, and soils of the Castle Creek watershed, Central Sierra Snow Laboratory, as a basis for studying methods of improving water yield.

(245) PATRIC, JAMES H.
1959. Increasing water yield in southern California mountains. Jour. Amer. Water Works Assoc. 51(4): 474-480, illus.

Reports methods and some first results of removing canyon-bottom trees and replacing hillside brush with grasses in calibrated watersheds, each with a control watershed, at the San Dimas Experimental Forest.

(246) PATRIC, J. H.
1959. Sulfur dioxide as a defoliant of chaparral plants. Jour. Forestry 57(6): 437-438, illus.

Sulfur dioxide gas proved to be an effective defoliant of several chaparral plants--and hence a possible means of reducing water loss by transpiration. Describes objectives, techniques, costs, and effects of using this gas in small-scale tests with shrubs and trees on the San Dimas Experimental Forest.

(247) REIMANN, LYLE F.
1959. Mountain evaporation--data from the San Dimas Experimental Forest. U. S. Forest Serv. Pacific Southwest Forest and Range Expt. Sta. Misc. Paper 35, 14 pp., illus.

Presents monthly summaries of evaporation pan measurements at four stations at 1,500 to 5,100 feet elevation on the San Dimas Experimental Forest. Data from the standard U. S. Weather Bureau pan at Tanbark Flat, 2,800 feet altitude, cover 23 years through 1957-58; data from other pans and locations cover shorter periods.

(248) REIMANN, LYLE F.
1959. Mountain temperatures--data from the San Dimas Experimental Forest. U. S. Forest Serv. Pacific Southwest Forest and Range Expt. Sta. Misc. Paper 36, 33 pp., illus.

Contains summaries of monthly mean, annual mean, highest and lowest air temperatures recorded at 8 elevations in the San Dimas Experimental Forest. The longest period reported is the 25 years through 1933-58, at the Tanbark Flat climatic station, altitude 2,800 feet.

(249) REIMANN, LYLE F., and HAMILTON, EVERETT L.
1959. Four hundred sixty storms--data from the San Dimas Experimental Forest. U. S. Forest Serv. Pacific Southwest Forest and Range Expt. Sta. Misc. Paper 37, 101 pp.

Presents data from the master recording raingage at Tanbark Flat field headquarters for the 25-year-period 1933-58. Tables give rainfall amounts by days, maximum rainfall rates by storms, and pertinent storm data by hydrologic years.

(250) RICE, RAYMOND M.
1959. Snow management research in high Sierra range. Jour. Range Mangt. 12(1): 13-16, illus.

After reviewing the sources of California's water supply and the research program under way in the snow zone, the author reports some research findings on the extent of forest, brush and grass cover in the Sierra Nevada. He then suggests some ways in which land management for water production may affect land management for range purposes.

(251) RICHARDS, LUCILLE G.
1959. Forest densities, openings, ground cover, and slopes in the snow zone of the Sierra west-side. U. S. Forest Serv. Pacific Southwest Forest and Range Expt. Sta. Tech. Paper 40, 21 pp., illus.

Reports density of forests, extent of forest openings, extent of brush cover, and slope steepness and exposure and their interrelation, as determined from intensive study of air photographs and topographic maps.

(252) ROWE, PERCY B.
1955. Rainfall disposition by hydrologic years, 1938-39 through 1952-53, Volfe Canyon, watershed IX, San Dimas Experimental Forest. U. S. Forest Serv. Calif. Forest and Range Expt. Sta. 3 pp., illus.

Reports annual precipitation, streamflow, evapotranspiration, storage and water yield of a chaparral watershed for a period of 15 years. Only 1/3 of the water yield appeared as streamflow. Saturation capacity of the watershed was not approached, even in the years of heaviest rainfall.

(253) ROWE, P. B.
1956. Research by the U. S. Forest Service, San Dimas Research Center. Conf. on Sediment Problems in California, Committee on Research in Water Resources, University of California at Berkeley, Proc. 1956: 23-25.

Describes erosion problems of southern California mountain watersheds, erosion research at the San Dimas Research Center, and research needed.

(254) ROWE, P. B.
1958. Tests of applied watershed management to increase water yield, San Dimas Experimental Forest. 2nd Ann. meeting, Arizona Watershed Program, Proc. 1958: 59-62, illus.

Discusses the results of plot tests to increase water yield by converting native brush to grass and grass-forb vegetation and the soil-vegetation-rainfall conditions required to save water. Describes the treatments of vegetation to increase water yield being applied on calibrated watersheds in Big Dalton Canyon.

(255) SINCLAIR, J. D.
1960. Watershed management research in southern California's brush covered mountains. Jour. Forestry 58(4): 266-268, illus.

Explains the vital role of southern California's brush covered mountains in water yield and flood control, describes the facilities for watershed management research at the San Dimas Experimental Forest, and presents highlights of some intensive studies made there. Water yields and losses were found to be influenced by type of plant cover and depth of soil, as well as by rainfall. Flood peaks and erosion were greatly increased in a watershed damaged by wildfire. Streamflow increased after trees and shrubs were removed from the canyon bottom of an experimental watershed.

(256) SINCLAIR, J. D., and PATRIC, J. H.
1959. The San Dimas disturbed soil lysimeters. International Union of Geodesy and Geophysics, Symposium on Woodlands and Water, Hannover-Munden, Germany, Proc. 1959: 116-125.

Describes the large confined and unconfined lysimeters, compares the growth of pine in the two types, and discusses the influence of plant species on rainfall disposition in the confined lysimeters.

(257) WALSH, KENNETH J.
1957. New meteorological and snow studies in the central Sierra. 25th Ann. Western Snow Conf. Proc. 1957: 43-45.

Reviews meteorological and snow measurements at 5 sites at the Central Sierra Snow Laboratory, and describes difficulties of cold weather operation experienced with certain instruments.

(258) WEST, ALLAN J.
1959. Snow evaporation and condensation. 27th Ann. Western Snow Conf. Proc. 1959: 66-74.

Reviews techniques of measuring evaporation and condensation at the snow surface, then gives results of studies at the Central Sierra Snow Laboratory in the winters of 1958 and 1959. Reports the relationship of evaporation to wind and atmospheric moisture; compares evaporation in forests, forest openings, and open sites with different exposures.

(259) WEST, ALLAN J., and KNOERR, KENNETH R.
1959. Water losses in the Sierra Nevada. Jour. Amer. Water Works Assoc. 51(4): 481-488, illus.

Reviews current snow hydrology research in California, then reports measurements of water loss by evapotranspiration in summer and by interception and evaporation in winter.

(260) WYCKOFF, PETE
1957. Snow surveys from the snow surveyors' side. 25th Ann. Western Snow Conf. Proc. 1957: 57-59.

Discusses practical field aids to make the snow survey job safer and more effective.

(261) ZINKE, PAUL J.
1959. The influence of a stand of Pinus coulteri on the soil moisture regime of a large San Dimas lysimeter in southern California. International Union of Geodesy and Geophysics, Symposium on Woodlands and Water, Hannover-Munden, Germany, Proc. 1959: 126-138, illus.

Summer soil moisture loss rates were nearly the same at various depths under pine cover, but they diminished with depth in similar soil under a bare surface.

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